



VB027

HIGH VOLTAGE IGNITION COIL DRIVER POWER IC

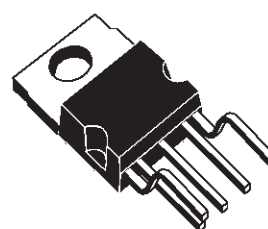
TYPE	V_{clamp}	I_{cl}	I_d
VB027	360 V	8.5 A	80 mA

- PRIMARY COIL VOLTAGE INTERNALLY SET
- COIL CURRENT LIMIT INTERNALLY SET
- LOGIC LEVEL COMPATIBLE INPUT
- DRIVING CURRENT QUASI PROPORTIONAL TO COLLECTOR CURRENT
- DOUBLE FLAG-ON COIL CURRENT

DESCRIPTION

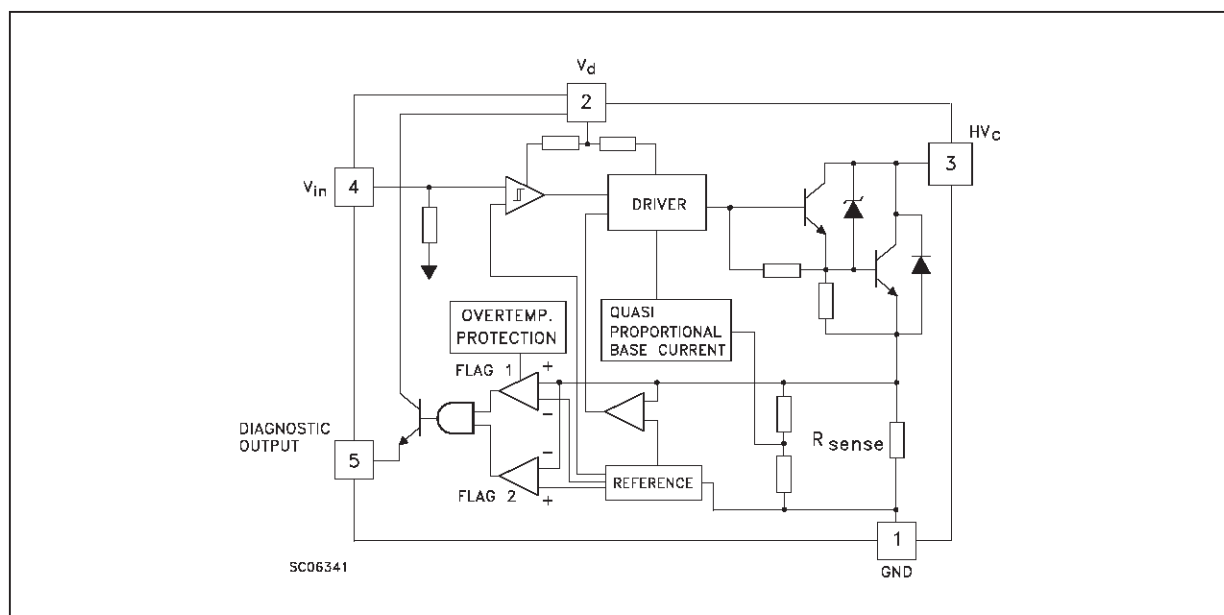
The VB027 is a high voltage power integrated circuits made using STMicroelectronics VIPower Technology, with vertical current flow power darlington and logic level compatible driving circuits.

Built-in protection circuits for coil current limiting and collector voltage clamping allows the VB027 to be used as a smart, high voltage, high current interface in advanced electronic ignition systems.



PENTAWATT HV

BLOCK DIAGRAM



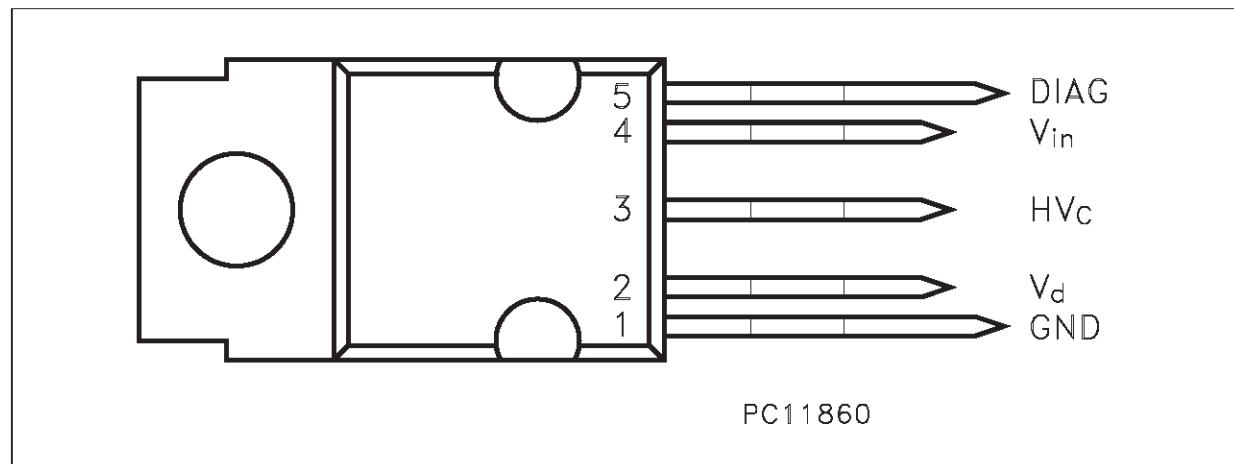
* Pins 1-5 = Power GND, Pin 6 signal GND. Pin 6 must be connected to pins 1-5 externally.

ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Value	Unit
HV_C	Collector Voltage	Internally Limited	V
I_C	Collector Current	Internally Limited	A
V_d	Driving Stage Supply Voltage	7	V
I_d	Driving Circuitry Supply Current	200	mA
V_{in}	Maximum Input Voltage	10	V
T_j	Operating Junction Temperature	-40 to 150	°C
T_{stg}	Storage Temperature Range	-55 to 150	°C

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction Case(MAX)	1.12	°C/W
$R_{thj-amb}$	Thermal Resistance Junction Ambient(MAX)	62.5	°C/W

CONNECTION DIAGRAM**PIN FUNCTION**

No	NAME	FUNCTION
1	GND	Emitter Power and Control Ground
2	Vd	Supply Voltage For The Power Stage
3	HV_C	Output to The Primary Coil
4	INPUT	
5	DIAGNOSTIC	Output of a Logic Signal When I_C Is Greater Than 3 A

ELECTRICAL CHARACTERISTICS ($V_b = 13.5\text{ V}$; $V_d = 5\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; $R_{\text{coil}} = 510\text{ m}\Omega$;
 $L_{\text{coil}} = 7\text{ mH}$; unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{cl}	High Voltage Clamp	$-40^\circ\text{C} \leq T_j \leq 125\text{ }^\circ\text{C}$ $I_{\text{coil}} = 6\text{ A}$	300	360	400	V
$V_{\text{ce(sat)}}$	Saturation Voltage of The Power Stage	$I_c = 6\text{ A}$; $V_{\text{in}} = 4\text{ V}$		1.5		V
$V_{\text{ce(sat)dt}}$	Saturation Voltage of The Power Stage Derating in Temperature	$I_c = 6\text{ A}$; $V_{\text{in}} = 4\text{ V}$ $-40^\circ\text{C} \leq T_j \leq 125\text{ }^\circ\text{C}$			2	V
$I_{\text{d(stdby)}}$	Stand-by Supply Current	$V_{\text{in}} = 0.4\text{ V}$			10	mA
$I_{\text{d(on)}}$	Power On Supply Current	$V_{\text{in}} = 4\text{ V}$ $I_c = 6\text{ A}$ $-40^\circ\text{C} \leq T_j \leq 125\text{ }^\circ\text{C}$			130	mA
V_d	Driver Stage Supply Voltage		4.5		5.5	V
I_{cl}	Coil Current Limit	$V_{\text{in}} = 4\text{ V}$ (see note 1)	8	8.5	9	A
$I_{\text{cl(td)}}$	Coil Current Limit Drift With Temperature	See figure 3				
V_{inH}	High Level Input Voltage		4		5.5	V
V_{inL}	Low Level Input Voltage		0		0.8	V
I_{inH}	High Level Input Current	$V_{\text{in}} = 4\text{ V}$			200	μA
V_{diagH}	High Level Diagnostic Output Voltage	$R_{\text{EXT}} = 22\text{ K}\Omega$ (see fig. 1)	3.5	*	V_d	V
V_{diagL}	Low Level Diagnostic Output Voltage	$R_{\text{EXT}} = 22\text{ K}\Omega$ (see fig. 1)			0.5	V
I_{diagTH1}	Diagnostic Current First Threshold		4.25	4.5	4.75	A
I_{diagTD1}	Diagnostic Current First Threshold Drift With Temperature	See figure 4				
I_{diagTH2}	Diagnostic Current Second Threshold		5.45	5.8	6.15	A
I_{diagTD2}	Diagnostic Current Second Threshold Drift With Temperature	See figure 5				
t_{dlc}	Delay Time Coil Current	$I_c = 6\text{ A}$ (see note 2)		25		μs
t_{flc}	Fall Time Coil Current	$I_c = 6\text{ A}$		8		μs
$t_{\text{d(diag)}}$	Delay Time Diagnostic Current	$R_{\text{EXT}} = 22\text{ K}\Omega$ (see fig. 1)		1		μs
$t_{\text{r(diag)}}$	Rise Time Diagnostic Current	$R_{\text{EXT}} = 22\text{ K}\Omega$ (see fig. 1)		1		μs
$t_{\text{f(diag)}}$	Fall Time Diagnostic Current	$R_{\text{EXT}} = 22\text{ K}\Omega$ (see fig. 1)		1		μs

Note 1: The primary coil current value I_{cl} must be measured 1 ms after saturation of the power stage.

Note 2: Time from input switching V_{NEG} until collector voltage equal 200V.

* $V_d - V_{\text{be(on)}}$

PRINCIPLE OF OPERATION

The VB027 is mainly intended as a high voltage power switch device driven by a logic level input and interfaces directly to a high energy electronic ignition coil.

The input V_{in} of the VB027 is fed from a low power signal generated by an external controller that determines both dwell time and ignition point. During V_{in} high ($\geq 4V$) the VB027 increases current in the coil to the desired, internally set current level.

After reaching this level, the coil current remains constant until the ignition point, that corresponds to the transition of V_{in} from high to low (typ. 1.9V threshold).

During the coil current switch-off, the primary voltage HV_c is clamped at an internally set value V_{cl} , typically 360V.

The transition from saturation to desaturation, coil current limiting phase, must have the ability to accommodate an overvoltage. A maximum overshoot of 20V is allowed.

FEEDBACK

When the collector current exceeds 4.5A, the feedback signal is turned high and it remains so, until the load current reaches 5.8A (second threshold), at that value, the feedback signal is turned low.

OVERVOLTAGE

The VB027 can withstand the following transients of the battery line:

-100V/2msec ($R_i = 10 \Omega$)

+100V/0.2msec ($R_i = 10 \Omega$)

+50V/400msec ($R_i = 4.2 \Omega$, with $V_{IN} = 3 V$)

FIGURE 1: Application Circuit

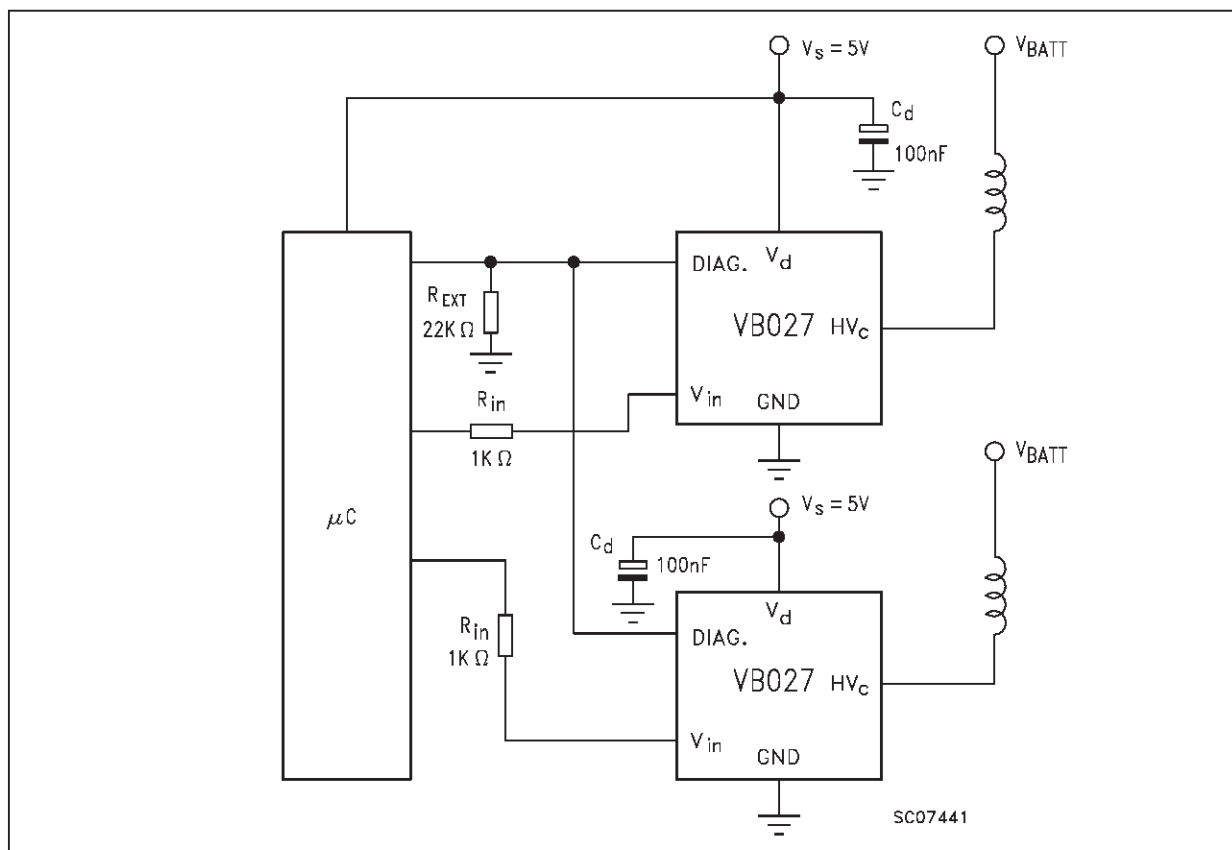
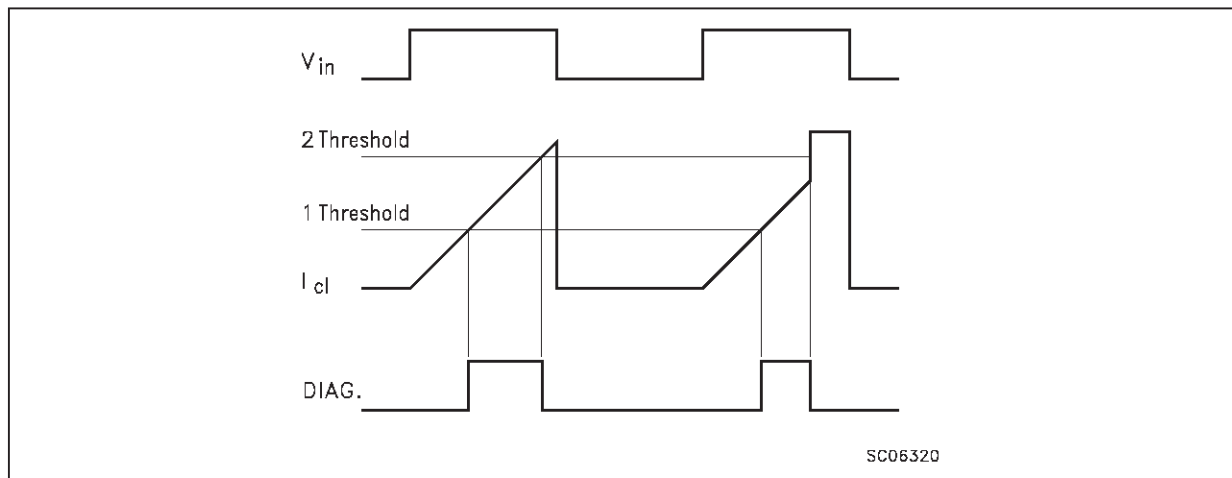
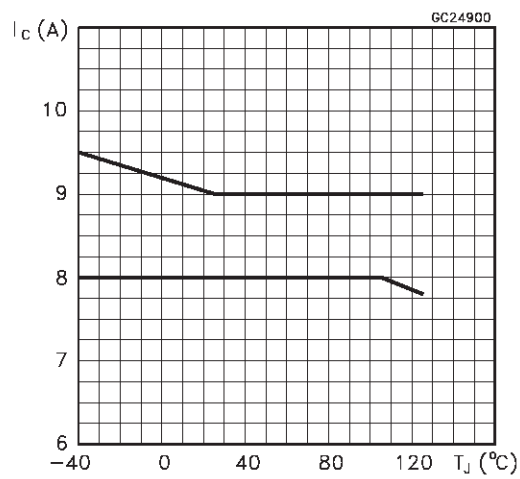
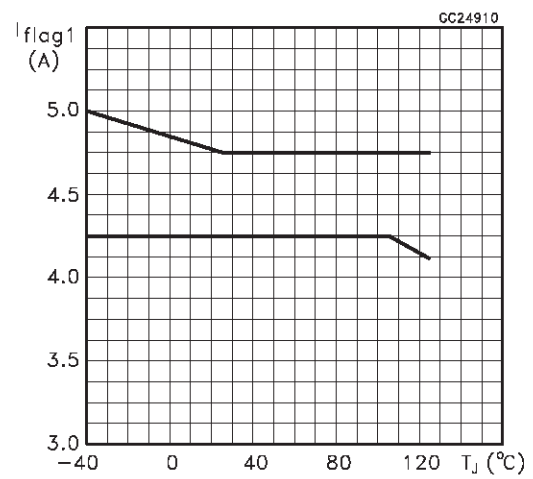
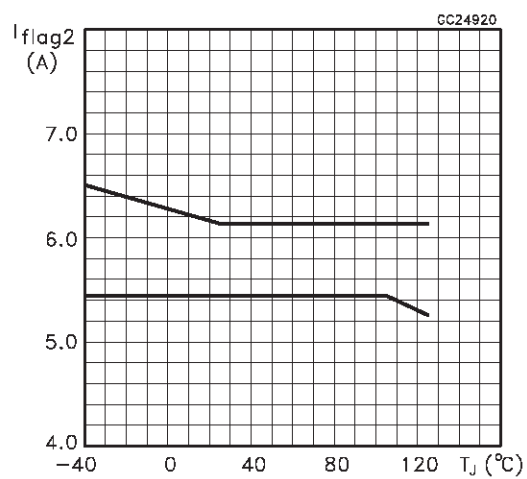
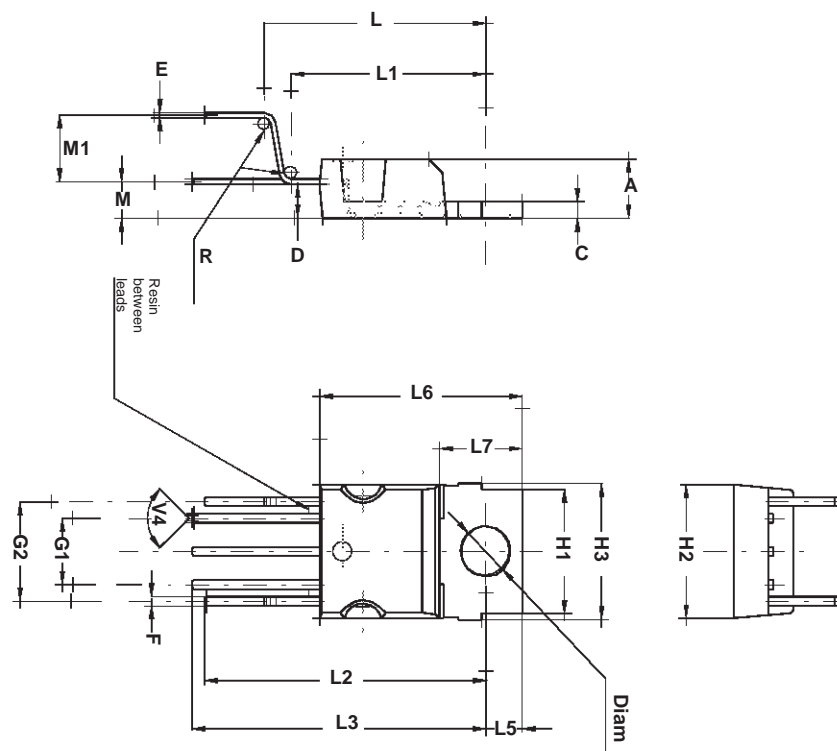


FIGURE 2: Switching Waveforms**FIGURE 3: Maximum I_{cl} Versus Temperature****FIGURE 4: I_{flag1} Versus Temperature****FIGURE 5: I_{flag2} Versus Temperature**

PENTAWATT HV (VERTICAL) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.30		4.80	0.169		0.189
C	1.17		1.37	0.046		0.054
D	2.40		2.80	0.094		0.110
E	0.35		0.55	0.014		0.022
F	0.60		0.80	0.024		0.031
G1	4.90		5.28	0.193		0.208
G2	7.42		7.82	0.292		0.308
H1	9.30		9.70	0.366		0.382
H2			10.40			0.409
H3	10.05		10.40	0.396		0.409
L	15.60		17.30	0.614		0.681
L1	14.60		15.22	0.575		0.599
L2	21.20		21.85	0.835		0.860
L3	22.20		22.82	0.874		0.898
L5	2.60		3.00	0.102		0.118
L6	15.10		15.80	0.594		0.622
L7	6.00		6.60	0.236		0.260
M	2.50		3.10	0.098		0.122
M1	7.56		8.16	0.298		0.321
R		0.50			0.020	
V4		90°			90	
Diam.	3.70		3.90	0.146		0.154



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